

Application No. 10/043,534

Reply to Office Action

*REMARKS/ARGUMENTS**The Pending Claims*

The pending claims are directed to a system for polishing a substrate comprising a liquid carrier, ammonium oxalate, a hydroxy coupling agent, fumed silica, and a polishing pad, wherein the system does not comprise an oxidizing agent. The pending claims are also directed to a method of polishing a substrate using the same. Claims 1-3, 5, 6, and 9-27 currently are pending.

Discussion of the Claim Amendments

Claim 1 has been amended to recite a system for polishing a substrate comprising fumed silica and a polishing pad. Claims 5 and 6 have been amended to recite that the abrasive is fumed silica. Support for these amendments can be found in the specification (e.g., at paragraph [0017], line 11). Claims 9, 10, and 11 have been amended to recite their dependencies on claim 1 instead of claim 7. Claims 4, 7, and 8 have been canceled without prejudice. No new matter has been added by way of these amendments.

Summary of the Office Action

Claims 1-8, 10-13, and 15-27 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Motonari et al. (i.e., U.S. Patent 6,447,695) (hereinafter "the Motonari '695 patent") in view of Sinha et al. (i.e., U.S. Patent 6,551,935) (hereinafter "the Sinha '935 patent"). Claims 9 and 14 stand rejected as allegedly unpatentable over the Motonari '695 patent in view of the Sinha '935 patent and further in view of Allman et al. (i.e., U.S. Patent 6,541,383) (hereinafter "the Allman '383 patent"). In addition, claims 19 and 25 stand rejected as allegedly unpatentable over the Motonari '695 patent in view of the Sinha '935 patent and further in view of Ni (i.e., U.S. Patent 6,503,766) (hereinafter "the Ni '766 patent").

Discussion of the Obviousness Rejections

The Office Action relies on the Motonari '695 patent for its disclosure of an aqueous dispersion comprising water, an abrasive, and a silane coupling agent (e.g., a hydroxyl coupling agent), wherein the aqueous dispersion normally contains no oxidizing agent. The

Application No. 10/043,534

Reply to Office Action

Office Action recognizes that the Motonari '695 patent does not specifically disclose using ammonium oxalate in the aqueous dispersion. The Office Action relies on the Sinha '935 patent for its disclosure of a method of using a planarizing solution comprising ammonium oxalate employed in a polishing system further including a polishing pad and abrasives. Since the Sinha '935 patent is directed to a polishing system for polishing metal with an aqueous dispersion, the Office Action alleges that one of ordinary skill in the art would have found it obvious to modify Motonari's aqueous dispersion to incorporate ammonium oxalate because the Sinha '935 patent discloses that one or more buffers such as ammonium oxalate may be used to adjust the pH of the solution to a desired level.

The pending claims, as currently amended, recite a system for polishing a substrate comprising (i) a liquid carrier, (ii) ammonium oxalate, (iii) a hydroxy coupling agent, (iv) fumed silica, and (v) a polishing pad, wherein the system does not comprise an oxidizing agent. The Motonari '695 patent does not disclose a polishing system comprising fumed silica, alone or with a hydroxyl coupling agent.

The Motonari '695 patent generally discloses an aqueous dispersion for chemical-mechanical polishing comprising abrasive particles which are used in conjunction with a polishing pad for chemical-mechanical polishing of a substrate. The abrasive particles can comprise inorganic particles such as silica (Motonari '695 patent at col. 3, line 49), organic particles comprising thermoplastic resins (Motonari '695 patent at col. 3, lines 64-67, and col. 4, lines 1-7), or organic/inorganic composite particles (Motonari '695 patent at col. 4, lines 12-36).

The specification of the Motonari '695 patent states that the composite particles may be prepared by polycondensation of an alkoxysilane in the presence of polymer particles and bonding of polysiloxane or the like on at least the surface of the polymer particles. The resulting polycondensate may be directly bonded to the functional group of the polymer particles, or it may be bonded via a silane coupling agent (Motonari '695 patent at col. 4, lines 18-26). The Motonari '695 patent teaches that silica particles, alumina particles, or the like may be used instead of an alkoxysilane and the like, and that the silica or alumina particles may be chemically bonded to the polymer particles by their functional groups such as hydroxyl groups and the like (Motonari '695 patent at col. 4, lines 30-35).

Application No. 10/043,534

Reply to Office Action

Thus, while the Motonari '695 patent refers to silica, it does not refer to fumed silica. Moreover, when silica abrasive particles are used, the Motonari '695 patent teaches that there is no need to use a silane coupling agent (e.g., a hydroxy coupling agent) because the silica particles can be chemically bonded to polymer particles by functional groups (e.g., hydroxyl groups) of the silica particles themselves, as opposed to via a silane coupling agent. Nowhere within the disclosure of the Motonari '695 patent is there a teaching or suggestion of an aqueous dispersion comprising both silica, let alone fumed silica, and a hydroxy coupling agent, as recited in the pending claims.

The Sinha '935 patent does not cure the deficiencies of the Motonari '695 patent. The Sinha '935 patent generally discloses a polishing slurry for chemical-mechanical polishing comprising an abrasive, an oxidizer, an inhibitor, optionally a pH control agent (e.g., ammonium oxalate), and water. The specification of the Sinha '935 patent provides that the polishing slurry disclosed therein can comprise an abrasive including silica (Sinha '935 patent at col. 6, lines 2-3) but does not teach or suggest a polishing composition comprising fumed silica or a hydroxy coupling agent.

The Office Action relies on the Allman '383 patent for its disclosure of gamma-ureidopropyltrimethoxysilane in an aqueous polishing composition. The Allman '383 patent does not cure the aforementioned deficiencies of the Motonari '695 patent and the Sinha '935 patent. The Allman '383 patent relates to an apparatus and method for planarizing the surface of a semiconductor wafer. The method disclosed in the Allman '383 patent comprises the application by spraying of an adherence promoting ligand (e.g., gamma-ureidopropyltrimethoxysilane) onto a wafer track of a planarization surface (Allman '383 patent at col. 6, lines 52-54) followed by spraying of abrasion particles onto the wafer track (Allman '383 patent at col. 7, lines 36-38), such that the abrasive particles are chemically bonded to the planarizing surface. Apart from a pH control solution, the Allman '383 patent is silent as to other chemical components useful in the disclosed method. Moreover, nothing within the Allman '383 patent teaches or suggests a polishing composition comprising an adherence promoting ligand, such as a gamma-ureidopropyltrimethoxysilane, in combination with fumed silica and with ammonium oxalate, as recited in claims 9 and 14.

Application No. 10/043,534

Reply to Office Action

The Office Action relies on the disclosure of the Ni '766 patent for its teaching that removal rate can be "optimized" by adjusting polishing parameters such as polishing agent flow rate. Nothing within the Ni '766 patent teaches or suggests a method of polishing a substrate, such as a substrate comprising copper and tantalum, with a polishing system comprising a liquid carrier, ammonium oxalate, a hydroxyl coupling agent, fumed silica, and a polishing pad, let alone wherein the ratio of the removal rate of copper to the removal rate of tantalum is at least 1:1 or more, as recited in pending claims 19 and 25.

In order to establish a *prima facie* case of obviousness, all of the claim limitations must be taught or suggested by the prior art. In the present case, the Motonari '695 patent, either alone or in combination with the Sinha '935 patent, the Allman '383 patent, and/or the Ni '766 patent, fails to teach or suggest a polishing system comprising a liquid carrier, a hydroxy coupling agent, ammonium oxalate, fumed silica, and a polishing pad, wherein the system does not comprise an oxidizing agent. None of these references discloses a polishing system involving the use of both fumed silica and a hydroxyl coupling agent as recited in the pending claims. For this reason alone, the obviousness rejections are improper and should be withdrawn. In addition, the Office Action's combination of the cited references appears to be based on impermissible hindsight. As is well settled, it is necessary for the teaching or suggestion to combine references to be found in the references themselves, or within the knowledge generally available to those of ordinary skill in the art at the time of invention, and not from Applicants' disclosure. However, the Office Action has failed to demonstrate any teaching or suggestion within any of the cited references that would lead one of ordinary skill in the art to combine their disclosures in the precise manner necessary to arrive at the subject matter recited in the pending claims. On this basis as well, the obviousness rejections are improper and should be withdrawn.

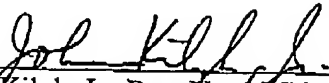
Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Application No. 10/043,534

Reply to Office Action

Respectfully submitted,



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